

REMARKS

Claims 1, 3-7, 9, 12, and 13 have been amended.

Claims 6 and 13 have been cancelled.

New Claims 14-24 have been added.

Claims 1-5, 7-12, and 14-24 are currently pending in this application.

Claims 1, 4, 9, 16, and 20 are in independent format.

1. Species Election

The Examiner has stated that the application contains four patentably distinct species of the claimed invention: Species A, illustrated in Figures 1 and 2; Species B, illustrated in Figures 3 and 4; Species C, illustrated in Figures 1 and 2 after the substitution of the aerial shell 300 for the pyrotechnic composition 132; and Species D, illustrated in Figures 3 and 4 after the substitution of the aerial shell 300 for the pyrotechnic composition 228.

As set forth below, Applicant respectfully traverses the restriction on the ground that the species are not patentably distinct. In the event Applicants' arguments are not deemed persuasive, Applicant hereby elects Species A.

Currently, claims 1-4, 9-11, and new claims 14-18 and 20-22 are readable on Figures 1 and 2 of Species A. Claims 1 and 9 are considered generic over Species A and B. New Claims 16 and 20 are considered generic over all species.

The species of the claimed invention as set forth by the Examiner are not patentably distinct, and are obvious variants of Applicants' invention. Applicants' invention is directed towards a method and apparatus for *employing smokeless propellant* in a pyrotechnic fireworks device. The specific nature of the propelled

burning component is not critical to the invention, i.e. a burning pyrotechnic composition or an ignited aerial shell. A pyrotechnic fireworks device is a device which expels a burning pyrotechnic composition or a bursting body (aerial shell) having a burning fuse (See: Para. [0007 and 0023]), as contrasted with non-burning bodies, such as confetti or noise makers (See: Para. [0006]). Smokeless or reduced smoke propellants, such as nitrocellulose (as contrasted with black-powder propellants) combust at relatively low temperatures, and lack sufficient heat of combustion to ignite the propelled component, pyrotechnic compositions or fuses on aerial shells (See: Para. [0006]).

Applicants' invention solves the problem of the relatively low combustion temperature associated with smokeless or reduced smoke propellants by incorporating combustion delaying components and/or flame propagation components into a pyrotechnic fireworks device, providing time for a flame to ignite and spread on a pyrotechnic composition or aerial shell fuse prior to expulsion from a launch tube by ignition of the smokeless or reduced smoke propellant. (See: Para. [0008 – 0012]). The function of the delaying component is to ensure that the component which is to be expelled from the firework in a burning state has sufficient time to ignite prior to the ignition of the smokeless or reduced smoke propellant. A variety of components may be utilized to achieve this delay, include a flame delay element (Species A and C) or the use of separate controlled ignition sources (Species B and D).

Furthermore, the solution provided by Applicants' invention is applicable to a wide range of pyrotechnic firework devices, of which burning pyrotechnic compositions (Species A and B) and bursting aerial shells (Species C and D) are but two examples of

the component which must be ignited prior to the delayed ignition of the smokeless or reduced smoke propellant.

Accordingly, the species of the claimed invention as set forth by the Examiner are not patentably distinct, and are considered to be obvious variants of Applicants' invention which is directed towards a method and apparatus for employing smokeless propellant in a variety of pyrotechnic fireworks device in place of conventional black-powder propellants.

2. Drawing Rejections

The Examiner has objected to the Drawings under 37 CFR 1.83(a) as failing to show every feature of the invention specified in the claims. Specifically, the Examiner has stated that the pyrotechnic prime composition; the at least one ignition source within the enclosed base proximate the pyrotechnic prime composition or delay fuse; and the second ignition source within the enclosed base proximate the pyrotechnic propellant are not shown in the figures.

The pyrotechnic prime composition is a thin layer of an easily ignitable material spread onto a surface, and accordingly, does not lend itself to illustration. However, to address the Examiner's objection, Figures 1 and 2 have been amended to illustrate a layer 127 of pyrotechnic prime composition deposited on the upper surface 128 of the gas sealing disk 124, as described at Para. [0028]. The layer 127 as illustrated, will be understood by those of ordinary skill in the art as being exaggerated in thickness for purposes of illustration. Similarly, Figures 3 and 4 have been amended to illustrate a layer 127 of the pyrotechnic prime composition deposited on the upper surface 226 of the gas sealing disc 224, as described at Para. [0039]. Since these layers are fully

described in the Specification, no new matter is believed added by these drawing amendment.

The ignition source within the enclosed base, proximate to the pyrotechnic prime composition or delay fuse as set forth in Claims 4, 6, 9, and 13 is illustrated in the original drawing figures at reference numeral 140. However, Applicants appreciate that the original drawing figures illustrate the ignition source using geometric shapes which are confusingly similar to reference numeral lines and arrows. Accordingly, Figures 1 and 2 have been amended to better distinguish ignition source 140 from other reference numeral lines and arrows. Similarly, Figures 3 and 4 have been amended to better distinguish first and second ignition sources 234 present in the original drawing figures from reference numeral lines and arrows.

Since these amendments associated with ignition sources 140 and 234 are merely clarifications of items present in the original drawing figures, no new matter is believed added by these drawing amendments.

As amended and clarified, the drawings are believed to show every feature of the invention specified in the claims, and accordingly, are believed to overcome the Examiner's objections under 37 CFR 1.83(a).

3. Rejections Under 35 U.S.C. § 112, First Paragraph

The Examiner has rejected Claims 1-13 under 35 U.S.C. § 112, first paragraph as failing to comply with the written description and enablement requirements.

a. "Pyrotechnic Prime Composition" and "ignition sources"

First, the Examiner has stated that it is not understood how the un-illustrated "pyrotechnic prime composition" or "one or more ignition sources" disposed within the

combustion chamber proximate the pyrotechnic composition perform the function of propagating flame over the surfaces of the pyrotechnic composition. Furthermore, the Examiner states it is not understood how the un-illustrated prime composition or one or more ignition sources are activated or from what materials these prime compositions or ignition sources are composed.

A “pyrotechnic prime composition” is well understood by those of ordinary skill in the fireworks or pyrotechnic field. Specifically, it is also known as a “first fire composition” and is simply a composition of materials which takes fire easily (i.e. ignites) and then transmits the ignition smoothly and evenly to the outside surfaces of the main composition or pyrotechnic material which is intended to provide the desired fireworks effect, i.e. color or sparks, which is normally more difficult to ignite. For example, the ‘528 *Beattie* reference cited by the Examiner discusses “priming compounds” at Col. 3, line 73 – Col. 4, line 6.

An “ignition source” is well understood by those of ordinary skill in the fireworks or pyrotechnic field to be any device that provides the heat or energy to ignite or initiate a pyrotechnic element. An ignition source may be as simple as a fuse cord on a firecracker or as complex as an electric delay detonation device such as used in high explosives. Generally, for pyrotechnic display devices, the most common ignition sources are electric matches, which ignite upon the application of an electrical charge.

The use of these terms in Claims 1-13 is readily understood by those of ordinary skill in the field of pyrotechnic display devices, and accordingly, the chemical and physical reactions of flame propagation and combustion need not be recited within the claims. Activation of an ignition source depends upon the specific type of ignition

source utilized. An electric match will activate (ignite) upon application of a sufficiently large electrical current. A fuse will activate (ignite) upon application of a sufficient amount of heat (typically from a match). The specific methods by which the ignition sources set forth in the claims are ignited depends upon the specific type of ignition source used, and accordingly is not recited within the claims, which do not require any particular type of ignition source.

Accordingly, Claims 1-13 are believed to comply with the requirements of 35 U.S.C. § 112, first paragraph, by presenting the claimed invention in full, clear, concise, and exact terms as to enable any person skilled in the art of pyrotechnic display devices to make and use the invention.

b. Claims 6 & 13

With regards to Claims 6 and 13, the Examiner states that no single embodiment contains both a first ignition source for combustion of the pyrotechnic composition and a second ignition source for combustion of the at least one aerial shell 300, consequently, Claims 6 and 13 lack enabling disclosure.

Claims 6 and 13 have been cancelled without prejudice to the filing of a continuation with respect thereto.

c. “Smokeless Pyrotechnic Propellant”

Finally, the Examiner states that the written description of the term “a smokeless pyrotechnic propellant” as used through out the claims lacks specifics as to what propellants would qualify as the claimed smokeless pyrotechnic propellants.

A smokeless pyrotechnic propellant is well understood by those of ordinary skill in the art of pyrotechnics as a pyrotechnic propellant which burns essentially smoke

free with little or no visible exhaust gases, i.e., with exhaust gases which leave no smoke or vapor trail. The written description, at Para. [0022], defines the term smokeless as intending to “describe pyrotechnic applications which generate significantly less visible smoke than found in traditional black-powder applications” and is “not intended to be limiting to only pyrotechnic applications which produce no visible smoke.” Further, the written description at Para. [0027] identifies nitrocellulose as a preferable “smokeless lift charge or pyrotechnic propellant” for use with the present invention.

Accordingly, Claims 1-13 are believed to comply with the requirements of 35 U.S.C. § 112, first paragraph, by presenting the claimed invention in full, clear, concise, and exact terms (i.e. smokeless pyrotechnic propellant) as to enable any person skilled in the art of pyrotechnic display devices to make and use the invention.

4. Rejections Under 35 U.S.C. § 112, Second Paragraph

The Examiner has rejected Claims 1-8 and 13 under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant has amended the claims to particularly point out and distinctly claim the subject matter which applicant regards as the inventions, and in particular, has corrected the limitations lacking antecedent basis in Claims 1, 2, 3, 4, and 13 as specifically identified by the Examiner. Accordingly, the claims are now believed to be definite, and to meet the requirements of 35 U.S.C. § 112, second paragraph.

5. Rejections Under 35 U.S.C. § 103(a)

The rejection of Claims 1-5 and 7-12 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 2,459,687 to *Decker* in view of U.S. Patent No. 2,442,528 to *Beattie* are respectfully traversed. The Examiner's stated basis for the rejection is that the '687 *Decker* reference discloses the claimed invention except for a smokeless pyrotechnic propellant, and that the '528 *Beattie* reference discloses a pyrotechnic propellant that is smokeless. Hence, the Examiner contends that it would have been obvious to one of ordinary skill in the art to substitute one type of pyrotechnic propellant for another.

Substituting a smokeless pyrotechnic propellant from the '528 *Beattie* reference into the aerial signal device if the '687 *Decker* reference completely fails to render obvious applicant's claimed invention. The '687 *Decker* reference discloses an aerial signal device which is designed to launch or propel a charge of pyrotechnic material. The pyrotechnic material is ignited *after* ignition of the propellant by a time fuse (42).

"It is apparent that when the expelling charge 30 is exploded, as heretofore described, the quick matches or fuses 45, 46, and 47 will be ignited, and in turn, the time fuse 42 and the pyrotechnic material in the lower container, which will continue to burn until consumed, ..." (Col. 3, lines 68-74).

In other words, the pyrotechnic propellant of the '687 *Decker* reference is ignited *first*, which then explodes to simultaneously ignite the time fuse (42) on a charge of pyrotechnic material and to expel it from the launching device or shell. Substituting the smokeless pyrotechnic propellant from the '528 *Beattie* reference for the expelling charge (30) of the '687 *Decker* reference does not change this sequence, and in fact, would not even result in a functional device.

As described in the present application, it is well known that smokeless pyrotechnic propellants combust at a relatively low temperature, and lack sufficient heat of combustion to ignite pyrotechnic compositions, their primes, or the delay fuses on aerial shells. (See: Para. [0006]). Accordingly, one of ordinary skill in the art of pyrotechnic display devices would have had no motivation to substitute the smokeless pyrotechnic propellant taught by the '528 *Beattie* reference for the pyrotechnic propellant in the '687 *Decker* aerial shell, since the initial combustion of the smokeless pyrotechnic propellant would not have provided sufficient heat of combustion to ignite the quick matches or fuses 45, 46, and 47, and in turn, the time fuse 42 and the pyrotechnic material.

This is exactly the problem which is addressed and solved by the present invention. Claims 1-5 and 7-12 set forth pyrotechnic display devices and specific methods for discharging the same which use a smokeless pyrotechnic propellant and which overcome the associated problem of low combustion temperatures. Specifically, the devices of the present invention are configured with means to ignite the pyrotechnic charges or aerial shell fuses *before* ignition of the smokeless pyrotechnic propellant, either through the use of delay components or separate controlled ignition sources. As a method, the present invention teaches methods for igniting the pyrotechnic charges or aerial shell fuses *before* ignition of the smokeless pyrotechnic propellant. The cited combination of references utterly fails to recognize the problem of low combustion temperatures associated with smokeless propellants, or to provide any means or methods to overcome this problem for use of smokeless pyrotechnic propellants in pyrotechnic display devices.


Accordingly, Claims 1-5 and 7-12 are seen as allowable under 35 U.S.C. § 103(a) as being patentable over U.S. Patent No. 2,459,687 to *Decker* in view of U.S. Patent No. 2,442,528 to *Beattie*.

6. Conclusion

Based on the foregoing, the allowance of claims 1-5, 7-12, and 13-24 is requested.

If for any reason the Examiner is unable to allow the application on the next Office Action and feels that an interview would be helpful to resolve any remaining issues, the Examiner is respectfully requested to contact the undersigned attorney for the purpose of arranging such an interview.

Respectfully submitted,



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